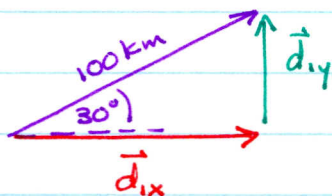


# PRACTICE MAKES PERFECT

#1



$$\begin{aligned}\vec{d}_{1x} &= 100 \cos 30^\circ \\ &= 86.6 \text{ km [E]}\end{aligned}$$

$$\begin{aligned}\vec{d}_{1y} &= 100 \sin 30^\circ \\ &= 50.0 \text{ km [N]}\end{aligned}$$

#2



$$\begin{aligned}\vec{d}_x &= 20 \sin 30^\circ \\ &= 10 \text{ km [W]}\end{aligned}$$

$$\begin{aligned}\vec{d}_y &= 20 \cos 30^\circ \\ &= 17.3 \text{ km [N]}\end{aligned}$$

#3

$$\begin{aligned}\Delta \vec{d}_R &= \Delta \vec{d}_1 + \Delta \vec{d}_2 + \Delta \vec{d}_3 \\ &= 30 \text{ m [N]} + 20 \text{ m [N } 30^\circ \text{ E]} + 20 \text{ m [S]} \\ &= 29.1 \text{ m [E } 70^\circ \text{ N]}\end{aligned}$$

HORIZ.  $\oplus \rightarrow$

$$\begin{aligned}\Delta \vec{d}_{1x} &= \emptyset \\ \Delta \vec{d}_{2x} &= 20 \sin 30^\circ \text{ m} \\ \Delta \vec{d}_{3x} &= \emptyset\end{aligned}$$

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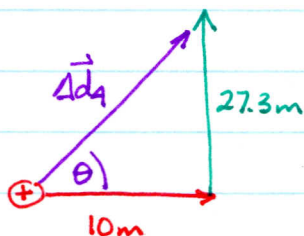

$$\Delta \vec{d}_{4x} = 10 \text{ m}$$

VERTICALLY  $\uparrow \oplus$

$$\begin{aligned}\Delta \vec{d}_{1y} &= 30 \text{ m} \\ \Delta \vec{d}_{2y} &= 20 \cos 30^\circ \text{ m} \\ \Delta \vec{d}_{3y} &= -20 \text{ m}\end{aligned}$$

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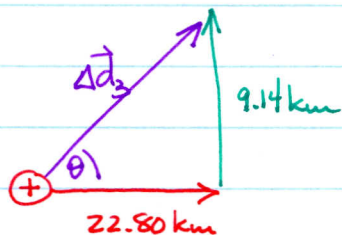

$$\Delta \vec{d}_{4y} = 27.3 \text{ m}$$



$$\begin{aligned}|\Delta \vec{d}_4| &= \sqrt{10^2 + 27.3^2} \\ &= 29.1 \text{ m}\end{aligned}$$

$$\begin{aligned}\theta &= \tan^{-1}\left(\frac{27.3}{10}\right) \\ &= 70^\circ\end{aligned}$$

#4  $\Delta \vec{d}_3 = \Delta \vec{d}_1 + \Delta \vec{d}_2$   
 $= 20 \text{ km} [\text{N}45^\circ \text{E}] + 10 \text{ km} [\text{E}30^\circ \text{S}]$   
 $= 24.6 \text{ km} [\text{E}21.8^\circ \text{N}]$



Horiz.  $\oplus \rightarrow$   
 $\Delta \vec{d}_{1x} = 20 \sin 45^\circ \text{ km}$   
 $\Delta \vec{d}_{2x} = 10 \cos 30^\circ \text{ km}$

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 $\Delta \vec{d}_{3x} = 22.80 \text{ km}$

$$|\Delta \vec{d}_3| = \sqrt{22.80^2 + 9.14^2}$$

$$= 24.6 \text{ km}$$

Vert.  $\uparrow \oplus$   
 $\Delta \vec{d}_{1y} = 20 \cos 45^\circ \text{ km}$   
 $\Delta \vec{d}_{2y} = -10 \sin 30^\circ \text{ km}$

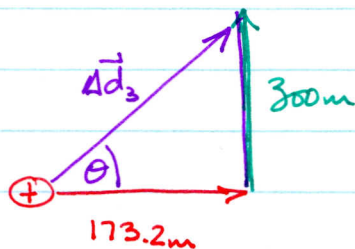
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 $\Delta \vec{d}_{3y} = 9.14 \text{ km}$

$$\theta = \tan^{-1} \left( \frac{9.14}{22.8} \right)$$

$$= 21.8^\circ$$

#5  $\Delta \vec{d}_3 = \Delta \vec{d}_1 + \Delta \vec{d}_2$   
 $= 200 \text{ m} [\text{W}] + 200 \text{ m} [\text{E}30^\circ \text{N}]$   
 $= 346 \text{ m} [\text{E}60^\circ \text{N}]$



Horiz.  $\oplus \rightarrow$   
 $\Delta \vec{d}_{1x} = \emptyset$   
 $\Delta \vec{d}_{2x} = 200 \cos 30^\circ \text{ m}$

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 $\Delta \vec{d}_{3x} = 173.2 \text{ m}$

$$|\Delta \vec{d}_3| = \sqrt{173.2^2 + 300^2}$$

$$= 346 \text{ m}$$

Vert.  $\uparrow \oplus$   
 $\Delta \vec{d}_{1y} = 200 \text{ m}$   
 $\Delta \vec{d}_{2y} = 200 \sin 30^\circ \text{ m}$

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 $\Delta \vec{d}_{3y} = 300 \text{ m}$

$$\theta = \tan^{-1} \left( \frac{300}{173.2} \right)$$

$$= 60^\circ$$

#6  $\Delta \vec{d}_3 = \Delta \vec{d}_1 + \Delta \vec{d}_2$   
 $= 100 \text{ m } [N10^\circ E] + 200 \text{ m } [W40^\circ S] = 139 \text{ km } [W12.5^\circ S]$

Horiz  $\oplus \rightarrow$   
 $\Delta d_{1x} = 100 \sin 10^\circ \text{ m}$   
 $\Delta d_{2x} = -200 \cos 40^\circ \text{ m}$   

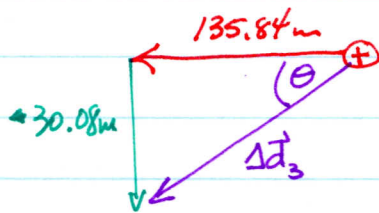

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 $\Delta d_{3x} = -135.84 \text{ m}$

Vert.  $\oplus \uparrow$   
 $\Delta d_{1y} = 100 \cos 10^\circ \text{ m}$   
 $\Delta d_{2y} = -200 \sin 40^\circ \text{ m}$   


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 $\Delta d_{3y} = -30.08 \text{ m}$

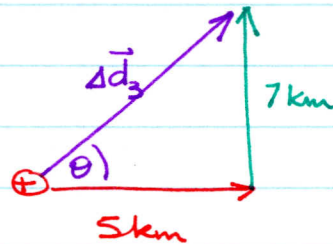


$$|\Delta \vec{d}_3| = 139 \text{ km}$$

$$\theta = \tan^{-1} \left( \frac{30.08}{135.84} \right) = 12.5^\circ$$

#7 (a)  $\Delta d = 5 + 7 = 12 \text{ km}$

(b)  $\Delta \vec{d}_3 = 5 \text{ km } [E] + 7 \text{ km } [N]$   
 $= 8.6 \text{ km } [E54.5^\circ N]$



$$|\Delta \vec{d}_3| = \sqrt{5^2 + 7^2}$$

$$= 8.6 \text{ km}$$

$$\theta = \tan^{-1} (7/5)$$

$$= 54.5^\circ$$

$$\begin{aligned}\#8 \quad \vec{\Delta d}_3 &= \vec{\Delta d}_1 + \vec{\Delta d}_2 \\ &= 20 \text{ km} [\text{E}25^\circ\text{N}] + 45 \text{ km} [\text{N}40^\circ\text{W}] \\ &= 44.3 \text{ km} [\text{W}75.9^\circ\text{N}]\end{aligned}$$

Horiz  $\oplus \rightarrow$

$$\begin{aligned}\Delta d_{1x} &= 20 \cos 25^\circ \text{ km} \\ \Delta d_{2x} &= -45 \sin 40^\circ \text{ km}\end{aligned}$$

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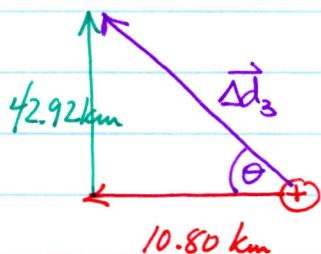

$$\Delta d_{3x} = -10.80 \text{ km}$$

Vert  $\uparrow \oplus$

$$\begin{aligned}\Delta d_{1y} &= 20 \sin 25^\circ \text{ km} \\ \Delta d_{2y} &= 45 \cos 40^\circ \text{ km}\end{aligned}$$

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$$\Delta d_{3y} = 42.92 \text{ km}$$



$$\begin{aligned}|\vec{\Delta d}_3| &= \sqrt{10.8^2 + 42.92^2} \\ &= 44.3 \text{ km}\end{aligned}$$

$$\begin{aligned}\theta &= \tan^{-1} \left( \frac{42.92}{10.80} \right) \\ &= 75.9^\circ\end{aligned}$$

$$\begin{aligned}\#9 \quad \vec{\Delta d}_4 &= \vec{\Delta d}_1 + \vec{\Delta d}_2 + \vec{\Delta d}_3 \\ &= 60 \text{ km} [\text{S}] + 35 \text{ km} [\text{N}45^\circ\text{E}] + 50 \text{ km} [\text{W}] \\ &= 43.2 \text{ km} [\text{W}54.6^\circ\text{S}]\end{aligned}$$

Horiz  $\oplus \rightarrow$

$$\begin{aligned}\Delta d_{1x} &= \emptyset \\ \Delta d_{2x} &= 35 \sin 45^\circ \text{ km} \\ \Delta d_{3x} &= -50 \text{ km}\end{aligned}$$

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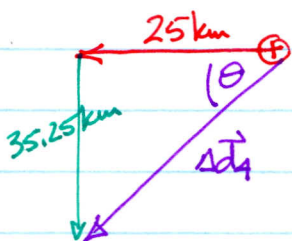

$$\Delta d_{4x} = -25 \text{ km}$$

Vert  $\uparrow \oplus$

$$\begin{aligned}\Delta d_{1y} &= -60 \text{ km} \\ \Delta d_{2y} &= 35 \cos 45^\circ \text{ km} \\ \Delta d_{3y} &= \emptyset\end{aligned}$$

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$$\Delta d_{4y} = -35.25 \text{ km}$$



$$\begin{aligned}|\vec{\Delta d}_4| &= 43.2 \text{ km} \quad \theta = \tan^{-1} \left( \frac{35.25}{25} \right) = 54.6^\circ\end{aligned}$$